

REMARKS

This application has been carefully reviewed in light of the Office Action dated October 6, 2003 (Paper No. 10). Claims 1 to 39 are in the application, of which Claims 1, 4 to 6, 21, 24 to 26 and 32 to 39 are independent. Claims 1, 4 to 6, 21, 24 to 26 and 32 to 36 have been amended. Reconsideration and further examination are respectfully requested.

Claims 1 to 39 are rejected under 35 U.S.C. § 103(a) over U.S. Patent No. 6,219,015 (Bloom), U.S. Patent No. 6,115,084 (Miyashita) and U.S. Patent No. 6,317,112 (Handschy).

The present invention generally concerns displaying images, where incident light is modulated by a space modulator according to input display data, and output. A plurality of light beams are illuminated onto the space modulator. Light emitted from the space modulator is projected on an image display screen.

Claims 1, 21 and 32

Claim 1 defines an image display apparatus which comprises a space modulation means, an illumination means, and a projection means. The space modulation means modulates incident light according to input display data and outputs the modulated incidence light. The illumination means time sequentially illuminates the space modulation means with a plurality of light beams having different colors. The projection means projects light emitted from the space modulation means upon an image display screen, wherein a white light illumination period is provided for the illumination means per each interval between illumination periods for the plurality of light beams having different colors.

Claim 21 concerns an image display method comprising illuminating and modulating steps. A space modulator is illuminated in the illuminating step with a plurality of light beams having different colors. The plurality of light beams are modulated, in the modulating step, according to input display data, wherein a white light illumination period is provided in each period between illumination periods for the plurality of light beams.

Claim 32 concerns an image display apparatus comprising a space modulator, an illuminator and a light projector. The space modulator modulates incident light according to input display data and outputs the modulated incidence light. The illuminator generates a plurality of light beams having different colors, time sequentially switches the generated light beams and illuminates the space modulator with the light beam. The light projector projects light emitted from the space modulator upon an image display screen, wherein a white light illumination period is provided for the illuminator per each interval between illumination periods for the plurality of light beams having different colors.

Thus, among its many features, the invention of independent Claims 1, 21 and 32: i) modulates incident light according to input display data and outputs the modulated incidence light; ii) time sequential illuminates a space modulator with a plurality of light beams having different colors; iii) projects light emitted from the space modulator upon an image display screen; and iv) a white light illumination period is provided per each interval between illumination periods for the plurality of light beams having different colors.

It is conceded in the Office Action that Bloom does not disclose the feature of providing a white light illumination period per each interval between illumination periods for each light beam having different colors.

The remaining art, namely Miyashita and Handschy, is not seen to remedy the noted deficiencies of Bloom.

Miyashita is seen to describe a display projector in which an input video signal is corrected using both digital and analogue techniques to perform gamma correction, the display projector having a light source that emits a white light which is separated into three primary colored light beams, and three liquid crystal light valves which modulate the separated light beams based on the input video signals. (See Miyashita, Abstract, col. 3, line 66 to col. 4, line 55.) Col. 11, lines 52 to 56 and emitters 944, 945 and 946 of Figure 19 of Miyashita are seen to describe the portions of the color separation system of the projector, which as described above is merely seen to separate a white light beam into three primary colors. Separating a white light beam into three primary colors and then modulating the three separate light beams is not seen to be the same as providing a white light illumination period per each interval between illumination periods for each light beam having different colors.

Handschy is not seen to remedy the deficiencies of Bloom and Miyashita. Handschy is seen to describe a liquid crystal image generator. (See Handschy, Abstract) It is not seen to disclose or to suggest providing a white light illumination period per each interval between illumination periods for each light beam having different colors.

Accordingly, the applied art is not seen to disclose providing a white light illumination period per each interval between illumination periods for each light beam having different colors.

For at least these reasons, independent Claims 1, 21 and 32 are believed to be allowable over the applied references.

Claims 4, 24, 33 and 37

Claim 4 defines an image display apparatus comprising a space modulation means, an illumination means and a projection means. The space modulation means modulates incident light according to input display data and emits the modulated incidence light. The illumination means time sequentially illuminates the space modulation means with a plurality of light beams having different colors. The projection means projects light emitted from the space modulation means upon an image display screen, wherein the illumination means has a white light illumination period having a length corresponding to an illumination light transition period provided per each interval between illumination periods for the plurality of light beams having different colors, and the space modulation means repeats modulation twice during a signal period overlapping the white light illumination period, by using a same modulated signal for a white light gradation display having a length corresponding to an illumination light transition period to thereby set the signal period having a length twice the illumination light transition period.

Claim 24 concerns an image display method comprising the steps of time sequentially illuminating a space modulator with a plurality of light beams having different colors, and modulating the plurality of light beams according to input display data, wherein a white light illumination period having a length corresponding to an illumination light

transition period is provided in each period between illumination periods for the plurality of light beams having different colors, and an operation of the space modulator overlaps the white light illumination period by applying a modulated signal for a white light gradation display having a length corresponding to the illumination light transition period.

Claim 33 concerns an image display apparatus comprising a space modulator, an illuminator and a light projector. The space modulator modulates incident light according to input display data and emits the modulated incidence light. The illuminator generates a plurality of light beams having different colors, time sequentially switches the generated light beams and illuminates the space modulator with the light beam. The light projector projects light emitted from the space modulator upon an image display screen, wherein the illuminator has a white light illumination period having a length corresponding to an illumination light transition period provided per each interval between illumination periods for the plurality of light beams having different colors, and the space modulator repeats modulation twice during a signal period overlapping the white light illumination period, by using a same modulated signal for a white light gradation display having a length corresponding to an illumination light transition period to thereby set the signal period having a length twice the illumination light transition period.

Claim 37 defines an image display method of generating a plurality of light beams having different colors, time sequentially switching the generated light beams, illuminating a space modulator with the light beam, and projecting light modulated by and output from the space modulator upon an image display screen, wherein the light modulated by the space modulator is modulated according to input display data, and wherein a white light illumination period having a length corresponding to an illumination

light transition period is provided in each period between illumination periods for the plurality of light beams having different colors, and an operation of the space modulator overlaps the white light illumination period by applying a modulated signal for a white light gradation display having a length corresponding to the illumination light transition period.

Thus, among its many features, the invention of independent Claims 4, 24, 33 and 37: i) modulates incident light according to input display data; ii) time sequentially illuminates a space modulator with a plurality of light beams having different colors; and iii) a white light illumination period having a length corresponding to an illumination light transition period is provided in each period between illumination periods for the plurality of light beams having different colors.

Based on the above discussion of the applied art, i.e., Bloom, Miyashita and Handschy, Claims 4, 24, 33 and 37 are believed to be patentable, since the applied art is not seen to disclose or to suggest a white light illumination period provided in each period between illumination periods for a plurality of light beams having different colors.

Claims 5, 25, 34 and 38

Claim 5 concerns an image display apparatus comprising a space modulation means, an illumination means, and a projection means. The space modulation means modulates incident light according to input display data and emits the modulated incidence light. The illumination means time sequentially illuminates the space modulation means with light beams of three primary colors of red (R), green (G) and blue (B). The projection means projects light emitted from the space modulation means upon an image display screen, wherein the illumination means has a plurality of groups each

having at least each of three boundary periods between red and green, green and blue, and blue and red, respectively of illumination periods of the three primary colors, of the plurality of groups, at least one group is supplied with a signal different from signals supplied to other groups, and a same group is applied with a same signal during each of the three boundary periods between red and green, green and blue, and blue and red.

Claim 25 defines an image display method comprising the steps of time sequentially illuminating a space modulator with a plurality of light beams having different colors, and modulating the plurality of light beams according to input display data, wherein of a plurality of groups each having at least each of three boundary periods between red and green, green and blue, and blue and red, respectively of illumination periods of the three primary colors, of the plurality of groups, at least one group is supplied with a signal different from signals supplied to other groups, and a same group is applied with a same signal during each of the three boundary periods between red and green, green and blue, and blue and red.

Claim 34 recites an image display apparatus comprising a space modulator, an illuminator and a light projector. The space modulator modulates incident light according to input display data and emits the modulated incidence light. The illuminator generates light beams of three primary colors of red (R), green (G) and blue (B), time sequentially switches the generated light beams and illuminates the space modulator with the light beam. The light projector projects light emitted from the space modulator upon an image display screen, wherein the illuminator has a plurality of groups each having at least each of three boundary periods between red and green, green and blue, and blue and red, respectively of illumination periods of the three primary colors, of the plurality of groups,

at least one group is supplied with a signal different from signals supplied to other groups, and a same group is applied with a same signal during each of the three boundary periods between red and green, green and blue, and blue and red.

Claim 38 defines an image display method of generating a plurality of light beams of three primary colors, time sequentially switching the generated light beams, illuminating a space modulator with the light beam, and projecting light modulated by and output from the space modulator upon an image display screen, wherein the light modulated by the space modulator is modulated according to input display data, and wherein of a plurality of groups each having at least each of three boundary periods between red and green, green and blue, and blue and red, respectively of illumination periods of the three primary colors, of the plurality of groups, at least one group is supplied with a signal different from signals supplied to other groups, and a same group is applied with a same signal during each of the three boundary periods between red and green, green and blue, and blue and red.

Thus, among its many features, the invention of independent Claims 5, 25, 34 and 38: i) modulates incident light according to input display data and outputs the modulated incidence light; ii) an illuminator time sequential illuminates a space modulator with light beams of three primary colors of red (R), green (G), and blue (B), the illuminator having a plurality of groups each having at least each of three boundary periods between red and green, green and blue and blue and red, respectively of illumination periods of the three primary colors; iii) projects light emitted from the space modulator upon an image display screen; and iv) of the plurality of groups, at least one group is supplied with a signal different from signals supplied to other groups, and a same group is applied with a

same signal during each of the three boundary periods between red and green, green and blue and blue and red.

Based on the above discussion, the applied art is not seen to disclose or to suggest at least one of the illuminator's groups being supplied with a signal different from signal supplied to other groups, and a same group is applied with a same signal during each of the three boundary period between red and green, green and blue and blue and red.

Accordingly, Claims 5, 25, 34 and 38 are believed to be patentable over the applied art.

Claims 6, 26, 35 and 39

Claim 6 defines an image display apparatus comprising a space modulation means, an illumination means, and a projection means. The space modulation means modulates incident light according to input display data and emits the modulated incidence light. The illumination means time sequentially illuminates the space modulation means with light beams of three primary colors of red (R), green (G) and blue (B). The projection means projects light emitted from the space modulation means upon an image display screen, wherein the illumination means has a plurality of groups each having at least each of three boundary periods between red and green, green and blue, and blue and red, respectively of illumination periods of the three primary colors, and the plurality of groups includes a first group having a white light illumination period having a length corresponding to an illumination light transition period during each boundary period and a second group without the white light illumination period during each boundary period.

Claim 26 concerns an image display method comprising steps of time sequentially illuminating a space modulator with a plurality of light beams having different

colors; and modulating the plurality of light beams according to input display data, wherein a plurality of groups each having at least each of three boundary periods between red and green, green and blue, and blue and red, respectively of illumination periods of the three primary colors, include a first group having a white light illumination period having a length corresponding to an illumination light transition period during each boundary period and a second group without the white light illumination period during each boundary period.

Claim 35 concerns an image display apparatus comprising a space modulator, an illuminator and a light projector. The space modulator modulates incident light according to input display data and emits the modulated incidence light. The illuminator generates light beams of three primary colors of red (R), green (G) and blue (B), time sequentially switches the generated light beams and illuminates the space modulator with the light beam. The light projector projects light emitted from the space modulator upon an image display screen, wherein the illuminator has a plurality of groups each having at least each of three boundary periods between red and green, green and blue, and blue and red, respectively of illumination periods of the three primary colors, and the plurality of groups includes a first group having a white light illumination period having a length corresponding to an illumination light transition period during each boundary period and a second group without the white light illumination period during each boundary period.

Claim 39 defines an image display method of generating a plurality of light beams of three primary colors, time sequentially switching the generated light beams, illuminating a space modulator with the light beam, and projecting light modulated by and

output from the space modulator upon an image display screen, wherein the light modulated by the space modulator is modulated according to input display data, and wherein a plurality of groups each having at least each of three boundary periods between red and green, green and blue, and blue and red, respectively of illumination periods of the three primary colors, include a first group having a white light illumination period having a length corresponding to an illumination light transition period during each boundary period and a second group without the white light illumination period during each boundary period.

Thus, among its many features, the invention of independent Claims 6, 26, 35 and 39: i) modulates incident light according to input display data and outputs the modulated incidence light; ii) an illuminator which time sequentially illuminates a space modulator with light beams of three primary colors of red (R), green (G), and blue (B), the illuminator having a plurality of groups each having at least each of three boundary periods between red and green, green and blue and blue and red, respectively of illumination periods of the three primary colors; iii) projects light emitted from the space modulator upon an image display screen,; and iv) of the plurality of groups includes a first group having a white light illumination period having a length corresponding to an illumination light transition period during each boundary period and a second group with the white light illumination period during each boundary period.

Based on the above discussion of the applied art, i.e., Bloom, Miyashita and Handschy, Claims 6, 26, 35 and 39 are believed to be patentable, since the applied art is not seen to disclose or to suggest a white light illumination period having a length

corresponding to an illumination light transition period during each boundary period and a white light illumination period during each boundary period.

Claim 36

Claim 36 defines an image display method comprising a step of time sequentially generating a plurality of light beams having different colors, and a step of modulating the plurality of light beams according to input display data, wherein a white light modulation period is provided in each period between modulation periods for the plurality of light beams.

Based on the discussion of Bloom, Miyashita and Handschy, the applied art, Claim 36 is believed to be patentable over the applied art, since it is not seen to disclose or to suggest modulating a plurality of light beams with a white light modulation period being provided in each period between modulation periods of the plurality of light beams.


CONCLUSION

The remaining claims are each dependent from the independent claims discussed above and are therefore believed patentable for the same reasons. Because each dependent claim is also deemed to define an additional aspect of the invention, however, the individual consideration of each on its own merits is respectfully requested.

In view of the foregoing amendment and remarks, the entire application is believed to be in condition for allowance and such action is respectfully requested at the Examiner's earliest convenience.

Applicant's undersigned attorney may be reached in our Costa Mesa,
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Respectfully submitted,


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